USGS

# WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Rapid Detection and Validation of Ecotoxicity in Watershed Drainages.

Duration of Project:

September 1, 1996 to August 31, 1997 (Years 2 and 3 on same schedule pending approval)

FY 1996 Federal Funding:

$ 24,883 $ 24, 883 $ 0

Total Direct Indirect

FY 1996 Non-federal Matching Funds Committed:

$49,854 $33,725 $16,129

Total Direct Indirect

Principal Investigator's Names and University:

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Congressional District:Sixth

Statement of Critical Regional Water Problem: In 1990 John Cairns stated in a keynote presentation before a national scientific meeting that no man-made instrument or gadget has ever been developed that is capable of measuring toxicity... only living systems can detect toxicity (Cairns 1990, Cairns and Mount 1990). Because a large number of toxicants can contribute to developing or episodic toxicity in a watershed drainage, continuously monitoring for toxicants in aquatic systems using analytical chemical methods is neither technically feasible or practical. Therefore, if we have no analytical

instrument available for continuously monitoring toxic risks in a watershed drainage, how can we address this critical water problem in a practical and cost effective manner? One approach would be to build a stand alone (remote) automated monitoring system which incorporates both physical/chemical and biological methods. To address this critical water problem we intend to employ advanced technologies and information management to: 1. integrate remotely operable biosensing systems, capable of generating rapid detection of toxicity, into existing instrumented physical water quality monitoring stations equipped with near real-time data communication links; 2. use this physical-biological information to initiate water sampling devices so that samples can be processed for causative agents and risk management needs; and 3. coordinate information through peer review and interested parties on internet and the information highway.

Because the proposed monitoring devices are interfaceable to and compatible with existing remote water quality stations, i.e. USGS, USTVA, and US Army COE data collection platforms, they have the potential of being both cost effective and providing resource managers, regulatory agencies, and industries with a "finger-on-the-pulse" of toxic risk at the watershed or regional drainage basin scales. Coupling biosensing, water quality and hydraulic conditions in GIS coverages and presenting these through internet will provide the public with access to information such as stage for canoers and the general ecological health of the system for the concerned citizen.

Research Results, Benefits and/or information:

Information generated from the proposed, continuously operable, biosensing complement to remote water quality monitoring stations can provide crucial input into multilevel watershed environmental management plans. This information would become a part of the data base used to characterize watershed features and presented through GIS. For example, once watershed attributes have been digitized and made available as map coverages, then timely water quality updates can be presented as easily recognizable images. As needed, ground truthing data from instream biological monitoring, i.e. fish and invertebrate surveys, and watershed features will improve resolution and support decision making.

Should a toxic episode be detected by one of the integrated water quality monitoring stations located along a drainage, then the event can be tracked and appropriate action taken. The most likely source of the problem can be identified and corrective action and possible restoration costs imposed where warranted.